23 minutes. The most expensive myth in the workplace.

What interruptions really cost.

The white paper on ergonomics.



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Executive Summary

23 minutes to full concentration? Sounds clear-cut. But it isn't.

Interruptions have very different effects depending on the task, timing and working environment. One thing is clear: frequent task switching consumes attention – and increases stress, susceptibility to errors and rework.

This white paper shows:

- why part of our attention remains attached to the previous task
- why many small interruptions have a stronger effect than a single one
- how workplaces and processes can make focused work easier

Focus can be designed: the aim is not to prevent every interruption. What matters is reducing avoidable interruptions and organising necessary coordination better – in the office, at the workbench and in the warehouse.

How focused is work in your organisation?

At the end of the white paper, complete the self-check for organisations. It shows where concentration is being lost and where you can take practical action.

You'll also find suitable solutions from kaiserkraft right there. So insight can become change.



AI GENERATED

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Introduction

10:14: an email pops up. 10:15: quickly answered. 10:32: only now does the original thought return. If at all.

It is much the same at the workbench: a colleague asks for a tool, a call has to be put through, a pallet blocks the way. And the visual inspection of the component has to start again from the beginning. In the warehouse: halfway through the picking list, the handheld beeps, a query comes in, and the employee first has to work out again which position they were about to pick. 23 minutes and 15 seconds. Almost everyone who deals professionally with productivity knows this figure. Supposedly, that is how long it takes to get back into a task after an interruption. It appears in advice articles, on LinkedIn, in internal presentations and even in reputable business media. Sounds plausible. Sticks in the mind. Unfortunately, it is not quite true.

The source: research by Gloria Mark, UC Irvine. The actual study – "The Cost of Interrupted Work: More Speed and Stress", CHI 2008 – shows something different: interrupted participants did not take longer than those who were able to work undisturbed. On the contrary, they were often faster. They simply made up the lost time. The catch: making it up came at a price. Not on the clock – in how people felt. More stress. More frustration. More errors.

The difference between myth and reality can be compared directly:

	If the 23-minute figure were correct	What the research actually shows
What happens	After an interruption, returning to the task takes around 23 minutes longer	The task is often still completed on time – through faster, more hurried work
What does it cost?	Time alone	Stress, frustration, higher error rate
Where visible	In the calendar, in processing time	In employees' experience, error statistics and sickness absence
Implication for organisations	Avoid interruptions to save time	Design interruptions and their accumulation so that stress and errors do not increase

That is the real message of this white paper, and it changes the whole calculation: anyone arguing with the 23-minute figure is counting the wrong thing. The duration of an interruption does not determine its cost. What matters is what task switching triggers over the course of the day – and which working conditions amplify or limit that effect.

This is how work happens today – in the office and in production, several times an hour. An average of 300 task switches a day. One interruption every two minutes. From an eight-hour day, often less than three hours of genuine focus time remain. Eliminate interruptions? Hardly possible, because collaboration also means being interrupted. But that does not have only negative consequences: coordination and exchange are essential for good collaboration. The real task is therefore to understand what accumulates over the working day and to design the working environment so that returning to concentration is easier – in the office, at the workbench and in the warehouse, where this issue has so far rarely been considered systematically.

Focus does not mean silence

Interruptions are part of work. A question, a shout across the room or a message can be important. It becomes problematic only when concentration and interaction constantly compete for the same attention instead of alternating within clear time windows. The aim is not isolation. It is clearer conditions for deciding what takes priority and when.

Why does this belong on the agenda of decision-makers? The business case has several dimensions: higher error rates and rework, more sickness absence in constantly interrupted environments, and longer throughput times for complex tasks. Chapters 2 to 4 show why – and what can be designed differently.

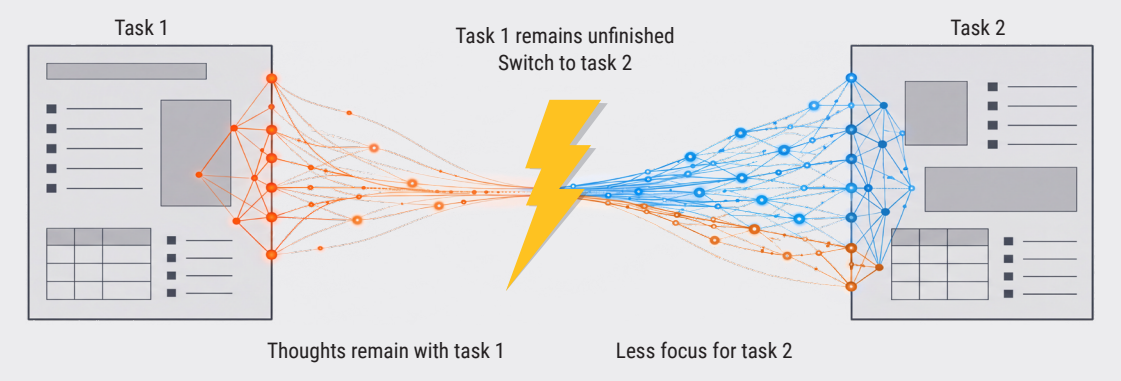
What to take away from this white paper

- The "23-minute" figure is a myth. Research mainly shows more stress and errors – not a blanket time loss of 23 minutes.
- Attention Residue explains why part of our attention remains attached to the previous task.
- What matters is not the individual interruption, but the pattern of frequency, timing and type of interruption.

Not every interruption is the same: how costly an interruption becomes depends on more than the fact that it happens.

Four questions help put it into context:	
How often?	One-off event or recurring pattern?
During what?	Routine task or activity requiring high concentration?
When?	Natural transition point or in the middle of a work step?
How complex?	Is the next step clear – or does the task first have to be reconstructed?

Attention Residue: Task 1 is interrupted for task 2



1. Attention Residue: part of you stays behind

As the introduction showed, the problem is not the duration of the interruption. So what is? Research calls it Attention Residue: after switching tasks, part of our mental capacity remains attached to the previous task. Even though work has already moved on.

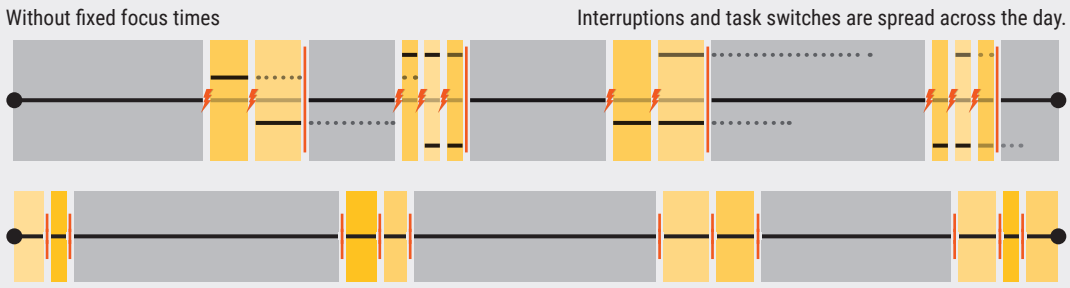
Developed by Sophie Leroy (University of Washington Bothell) together with Theresa Glomb (University of Minnesota). The core finding: after an interruption, hardly anyone returns immediately and completely to the original task. Some attention remains behind – especially when the task was unfinished and there was time pressure. The pattern was consistent: people who had to leave a task before completion demonstrably performed worse on the new task – not because it was harder, but because cognitive capacity was still tied up with the previous task. A more recent field study using diary methods (200 observations over several weeks) confirms this: more interruptions, more Attention Residue, more exhaustion at the end of the day. Attention Residue is not equally strong after every interruption. The task, timing and type of switch are among the factors that matter. Self-interruptions count too – for example through smartphones, switching tabs or spontaneous messages.

Attention Residue is not an office-only phenomenon. Anyone interrupted while visually inspecting a component, or who has to answer an interim question in the middle of an order-picking list, carries part of the previous task into the next – with measurable effects on errors and processing time, as Chapter 3 shows.

Design principles

1. **Practise Ready-to-Resume.** Leroy and Glomb showed in four studies that a short, deliberate plan before switching – where you stopped, what comes next, what remains open – demonstrably reduces Attention Residue and improves performance on the new task. No investment required. Just one habit: take a minute to ask, “Where am I, and what is still missing?”
2. **Filter rather than blocking everything.** Treat off-topic, complex requests differently from short, relevant questions. Park them instead of reacting immediately.
3. **Take self-interruption seriously.** Address not only noise and accessibility, but also your own impulse control. Deliberate distance from mobile devices during focus phases helps.

Same working hours. Different amounts of focus.



= interruption or task switch

2. One interruption is harmless. Twenty are not

A short phone call. A quick question. A notification. Taken individually: harmless. The problem comes from accumulation. Dozens of interruptions a day add up – and "eat into" the focus time that is actually available.

Across sectors, a similar pattern emerges: genuine, uninterrupted focus time often amounts to well under half of an eight-hour working day. Time-tracking data frequently show only two to three hours of genuine deep work per day for the average knowledge worker. Other sources put the minimum for good cognitive performance at four hours. The methods vary. The direction does not: focus time is structurally scarce. A second effect reinforces the picture: task-switching costs. The claim of a "40% productivity loss due to task switching" is often cited, but that figure comes from a different research strand from Attention Residue research. The two effects work together, but should not be combined into a single number if the aim is rigour. The core idea: the individual interruption is not what matters – it is the accumulation over hours and days that does the damage. Frequency, timing and the working environment determine how strongly interruptions linger – in the office just as at production and assembly workstations or in warehouse aisles.

Design principles

1. **Measure first, then protect.** Carry out an honest time audit over one to two weeks before introducing measures. Only what is measured can be improved.
2. **Separate avoidable from unavoidable.** Zero interruptions is not the goal. A realistic aim is to reduce avoidable interruptions – interim questions, self-interruptions – while keeping genuine urgent matters reachable.
3. **Show the cumulative effect.** Anyone who understands that interruptions add up sees meeting culture, spatial design and availability rules not as separate levers, but as a system. That fundamentally changes decisions.

3. Space matters too: office, workshop, warehouse

Interruptions are additive. So which environments produce fewer of them – and which amplify them? This is where the paths diverge: there is extensive research on spatial concepts for office work. The evidence base for workshops and warehouses is thinner – but the available studies show that interruptions and noise have similar effects there, often with more direct consequences: an incorrectly inspected component or an incorrectly picked pallet.

Office: When the interruption comes from the next desk

Numerous studies point in the same direction: on average, open-plan offices perform worse than private or small shared offices on concentration, satisfaction and health – although not to the same extent for every metric.

A systematic review of 31 directly comparable studies found more negative results in open offices for perceived productivity, concentration and satisfaction. A review of more than 300 research papers reaches a similar conclusion and highlights acoustics in particular: lower space costs are often offset by a "productivity tax" that can exceed the savings. Individual studies show, among other things:

- around 29% more interruptions
- 9% higher exhaustion rates
- up to 70% less face-to-face interaction after moving to an open office
- 18 to 62% more absence days than private offices

EEG measurements also suggest that the brain has to work harder in open workspaces to maintain the same level of performance. More spontaneous collaboration does not automatically result: employees often switch to email and chat to avoid disturbing colleagues directly.



Private offices, in turn, can encourage information silos and make onboarding more difficult. Several studies therefore find better results for hybrid concepts: with clear zones for focused work and clear zones for interaction.

Workshop and production: When the interruption happens in the component

In the office, an interruption shows up as a lost train of thought. In production, it can sometimes be seen directly in the result. Studies of assembly work show that interruptions caused by information and communication systems increase the number of errors and extend processing time. When and how a notification arrives also matters – poorly timed interruptions are particularly costly. The same applies to shift handovers. While one employee interrupts their work, the other has to absorb information, put it into context and understand the current status. A structured handover with a short checklist can reduce information loss and make the shift change easier.

Noise also consumes attention. In a BAuA study, 70 participants carried out proofreading tasks under various typical workplace sounds. Sounds containing speech measurably reduced performance. Louder construction-site noise without speech did not have the same effect. What matters, then, is not volume alone but how strongly a sound captures attention.

For activities requiring intense concentration, sound levels below regulatory limit and assessment values can already impair performance. Protective measures can therefore make sense even below 80 dB(A). As a German reference example, ASR A3.7 specifies a maximum assessment level of 55 dB(A) for activities with high concentration requirements. At EU level, Directive 2003/10/EC provides the common framework for protection against work-related noise. In Germany, the LärmVibrationsArbSchV, ArbStättV and ASR A3.7 also apply. In other EU countries, the relevant national regulations and values must be observed.



Warehouse and intralogistics: When the interruption happens during order picking

According to Fraunhofer IML, order picking is characterised by multitasking, recurring processes and time pressure. The cognitive load arises differently here than in the office – but it is just as real.

In monotonous activities, interruptions are often perceived as less disruptive. Even so, it can take longer to return to full concentration. Alternating between activities, working in team blocks and taking structured breaks can help counteract this.

Assistance systems such as Pick-by-Voice or Pick-by-Light change the nature of the strain, but do not automatically reduce it. Voice instructions intervene in the work rhythm, while light signals demand sustained attention. Some of the strain is therefore shifted from the physical to the mental domain.



Depending on when interruptions occur, they lead to different errors:

- during item search: wrong item
- while counting: wrong quantity
- during assignment: wrong pallet or wrong container

It is not only the interruption that matters. Its timing matters too.

What this means for workshops and warehouses:

Observation	Documented effect	Action point
Interruption by shout, phone call or system notification during assembly	More errors, longer processing time, in both the primary task and the interruption task	Bundle notifications; coordinate the timing of interruptions
Speech-containing background noise during inspection or control tasks	Measurably poorer performance, even below high sound levels	Acoustically separate inspection stations; keep the assessment level under ASR 3.7 in view
Shift handovers without structure or handover protocol	Higher error rates on the following shift, more difficult start to the new shift, greater psychological strain	Standardised shift-handover protocols (checklist, <10 min), clearly defined handover areas
Poorly designed assistance systems (Pick-by-Voice/Light)	Cognitive load is not reduced but shifted; greater susceptibility to errors due to divided attention	Adapt system notifications to the work rhythm, not the other way round; pilot before full roll-out
Multitasking and time pressure in order picking	Higher psychological strain, altered susceptibility to errors depending on the assistance system	Adapt order-picking technology and pacing to the actual cognitive load, not only to throughput

Three working environments. Four design principles.

The triggers differ. But everywhere, the working environment and processes determine how strongly interruptions affect concentration, error rates and stress.

Design principles

1. **Clearly separate focus and interaction.** Neither an open-plan office nor a purely private-office model delivers the best results. Clear zones for focused work, separate from zones for interaction – this applies to offices as well as inspection and assembly areas.
2. **Treat acoustics as a design lever, not a side issue.** Acoustic shielding – especially from sources containing speech – works equally in offices, workshops and warehouses.
3. **Coordinate notifications rather than merely reducing them.** In production, it is not only the number of interruptions that matters, but their timing. Systems and processes that shift interruptions to non-critical moments measurably reduce errors.
4. **Retreat spaces and inspection stations should be standard equipment.** Easily accessible focus areas in the office and acoustically separated inspection workstations in production address the same underlying problem.

4. Act instead of hoping: embed focus time structurally

Ready-to-Resume, deliberate pauses before switching tasks and good spatial design have only limited effect without organisational backing. Focus time works best as a binding, shared rule – not as an individual recommendation. The aim: reduce unnecessary switching and make it easier to return to the main task.

A well-documented example is the Focused Company model, introduced at several company sites in Germany: two interruption-free hours each day, usually in the morning – with no email, phone, chat or meetings. Only team assistants remain reachable for genuine emergencies. It takes around six months to embed the foundations, training and processes.

For workshops and warehouses, the same basic idea can be transferred using different means: protected inspection periods without shouted queries, coordinated time windows for questions and system notifications, and clear rules for genuine urgency. The overview shows the four recurring building blocks.

Organise focus. Here's how.



Design principles

1. **Pilot one component.** Not all at once. Test a protected morning block in the office or a low-interruption time window at an inspection station for a few weeks, adjust it, then make it binding.
2. **Define urgency before it becomes an excuse.** A short, clear list of what counts as an emergency – worded separately for office and production. Otherwise, the rule will collapse at the first exception.
3. **Make leadership visible.** If managers themselves book meetings during focus time or fail to observe the agreed time windows on the line, the rule loses its binding force.

5. Two organisations, the same design logic

Context

Enough theory. What does it look like in practice when an organisation takes this seriously? The following two scenarios are typical examples drawn from research and practice – not the names of real companies, but patterns that recur in offices and production environments.

Office: from constant interruption to protected core time

Typical starting situation: A sales support team in an open-plan office is constantly available for customer calls, chat messages and questions from sales colleagues. Complex quotations are prepared during the same hours as telephone customer service. The result: longer processing times, more rework due to careless mistakes, frustration on both sides.

Derived design approach: two fixed hours in the morning, blocked across everyone's calendars, with no phone cover while quotations are being prepared; a rota for availability; and a clearly visible signal at the workstation showing when someone does not want to be approached. This applies the building blocks from Chapter 4 to a specific role.

Workshop: when the inspection station becomes quiet

Typical starting situation: A quality-inspection station sits directly next to the order-picking area. Constant shouts, a hubbub of voices and system notifications in the background place a burden on exactly the concentration needed for visual inspection.

Derived design approach: acoustically separate the inspection station from the picking zone, set a fixed time window for questions to inspectors instead of spontaneous interruptions, and bundle system notifications rather than broadcasting them in real time. Here too, the building-block logic from Chapter 4 is applied to the specific workplace.

Two organisations, one design logic

The solution rarely lies in a single spatial concept. It lies in the deliberate combination of zoning, acoustics and coordinated communication – tailored to the activity in question. One concrete practical example is the kaiserkraft project reference LEHNER electronics: when a production hall was refitted, ergonomically considered, individually tailored workstations were the focus. The approach: do not treat symptoms one by one; tailor the working environment to the actual activity.

Understand first. Then design.

1. **Observe the activity:**
   Where, when and what causes interruptions?
2. **Identify the cause:**
   Is it the space, the acoustics, the process or the communication?
3. **Test a solution:**
   Try a suitable measure in day-to-day work and adapt it.
4. **Measure the effect:**
   What changes in errors, rework, stress and throughput time?

Self-check for your organisation

Your interruption balance – six questions to consider together. Answer them honestly:

1. How often are you interrupted on a typical day – roughly speaking?
☐ 1× ☐ 3× ☐ 7× ☐ 10× ☐ mehr als 10×
⇨ First see the frequency, then discuss it.

2. How many of these interruptions are self-generated – phone, switching tabs, checking something without an external prompt?
☐ 1× ☐ 3× ☐ 7× ☐ 10× ☐ mehr als 10×
⇨ Part of the solution lies in your own behaviour, not only in the environment.

3. Is there a place or a time when employees are guaranteed to be undisturbed?
☐ Place ☐ Time period ☐ neither
⇨ If not: the first building block is missing.

4. Are focus zones and communication zones visibly separated at your sites – including at inspection and assembly stations?
☐ yes ☐ no
⇨ The spatial dimension from Chapter 3.

5. Do queries and system notifications reach production and warehouse teams in a coordinated way, or in real time and unfiltered?
☐ coordinated ☐ unfiltered
⇨ Timing affects the error rate, not just the number of interruptions.

6. How do employees react after an interruption – stressed and rushed, or blocked and slowed down?
☐ stressed and rushed ☐ blocked and slowed down ☐ relaxed and calm
⇨ The personal link back to the introduction: stress rather than time loss.

Evaluation:

⇨ **Four or more "critical" answers** (frequent, mostly self-generated interruptions, no quiet retreat spaces, zones not separated, unfiltered timing, noticeable stress) are a clear signal: a pilot project from Chapter 4 is more worthwhile here than another round of internal discussion.

⇨ **Two to three critical answers** are often enough to start with a single component – for example, protected core time or an acoustically separated inspection station.

⇨ **Zero to one** probably means the foundations are sound; here, fine-tuning is more useful than a major redesign.

For printing and use on site.

Conclusion

The 23-minute figure does not work as a calculation. It was the reason to look more closely: the problem is not the individual interruption. The problem is what accumulates in stress, susceptibility to errors and strain when interruptions recur dozens of times a day – at the desk, at the workbench and in the warehouse aisle alike.

The ability to concentrate is not a character trait. Nor is it just an everyday nuisance. It is a resource – scarce, influenceable, and increasingly the difference between organisations that work productively and healthily and those that do not.

The next step does not have to be a major refurbishment project. It can start as small as the self-check above, a single component from Chapter 4 or an acoustically separated inspection station. What matters is to start, measure and build from there – with the right workplace design supporting you rather than another rule on paper.

Focus can be designed in.

Solutions for fewer distractions and more focused work:

- **Office:** Acoustic and work pods, room-in-room solutions, soundproof partitions and ergonomic furniture for retreat areas.
- **Workshop and production:** Soundproof booths and acoustic elements for inspection and control stations, plus signal and traffic-light systems for uninterrupted work phases.
- **Warehouse and intralogistics:** Noise-reducing partitions and ergonomically designed order-picking workstations.

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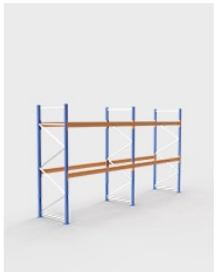
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Appendix

Glossary

Attention Residue
The phenomenon whereby, after switching tasks, part of a person's attention remains on the previous task even though work on a new task has already begun. Developed by Sophie Leroy (2009) and further developed together with Theresa Glomb.

Task-switching costs
The loss of performance caused by the cognitive process of switching between two different tasks – regardless of whether the switch is self-initiated or imposed externally.

Ready-to-Resume plan
A brief, deliberate preparation before a planned or forced task switch: where you stopped, what the next step is, what remains open. Proven to reduce Attention Residue.

Activity-based Working (ABW)
An office concept that provides different zones for different activities – such as focus zones, collaboration zones and retreat spaces – instead of one uniform type of space for every activity.

Assessment level
A noise value determined under the German Technical Rule for Workplaces ASR A3.7 for activities at workplaces in workrooms. For activity category I (sustained high concentration or high speech intelligibility), ASR A3.7 specifies a maximum assessment level of 55 dB(A).

Cognitive ergonomics
The design of work systems taking mental workload, information processing and attention into account – as a complement to traditional ergonomics, which is primarily focused on physical factors.

Shift handover / handover protocol
A structured handover format between shifts (typically 5–10 minutes, using a form or checklist). A standardised shift handover reduces errors on the night shift and reduces the Attention Residue effect when responsibility is handed back.

Pick-by-Voice / Pick-by-Light
Assistance systems used in order picking and warehousing that communicate work instructions visually or audibly. While both reduce physical strain, they shift cognitive load: voice instructions interrupt the internal work rhythm, while light signals require vigilance. The design determines whether assistance systems reduce or merely shift strain.

Types of order-picking errors
In order picking, interruptions typically lead to errors in the form of: (a) item-selection errors (wrong item), (b) quantity errors (wrong quantity), (c) container/pallet selection errors. Interruptions affect these error types differently – timing is therefore critical.

Predictable vs. Unpredictable Interruptions
Predictable interruptions (scheduled meetings, regular queries) can be managed in time. Unpredictable interruptions (machine failures, material shortages, spontaneous instructions) occur without warning. In workshops and warehouses, unpredictable interruptions predominate – which makes buffering and clear escalation paths more important than eliminating interruptions altogether.

Cognitive load
The mental effort required by an activity. It arises from task complexity, time pressure, interruptions and, in modern systems, assistance systems. In workshops and warehouses, cognitive load is often overlooked even though it is just as relevant as physical strain. Constant task switching caused by interruptions increases not only the error rate but also the risk of burnout.

Monotony effect (Vigilance Decrement)
The natural decline in attention during repetitive, monotonous activities (for example, warehouse order picking over 8 hours). Interruptions in monotonous activities have a different effect than in varied work: subjectively they are perceived as less disruptive, but returning to full concentration takes longer because the nervous system cannot use external stimuli as an activation cue. Changing position, working in team blocks and taking structured breaks can help prevent this.

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Note on the use of AI support:
This white paper was created using AI-assisted research and text production. All cited studies and sources were checked against the original sources. kaiserkraft is responsible for the specialist content and final editing.

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